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Wu

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(54) **CONFERENCE CALL AUTHENTICATION UTILIZING PASSCODES PERSONAL TO USERS**

(71) Applicant: **International Business Machines Corporation**, Armonk, NY (US)

(72) Inventor: **Frederick Y. Wu**, Greenwich, CT (US)

(73) Assignee: **International Business Machines Corporation**, Armonk, NY (US)

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(51) **Int. Cl.**

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H04L 29/06	(2006.01)
H04M 3/38	(2006.01)
H04L 12/18	(2006.01)
H04W 12/06	(2009.01)

(52) **U.S. Cl.**

CPC ***H04M 3/56*** (2013.01); ***H04L 12/1818*** (2013.01); ***H04L 63/083*** (2013.01); ***H04M 3/382*** (2013.01); ***H04M 3/563*** (2013.01); *H04W 12/06* (2013.01)

(58) **Field of Classification Search**

CPC H04M 3/56; H04M 3/382; H04M 3/563; H04L 12/1818; H04L 63/083; H04W 12/06

USPC 455/416, 410–411; 379/202.01, 204.01

See application file for complete search history.

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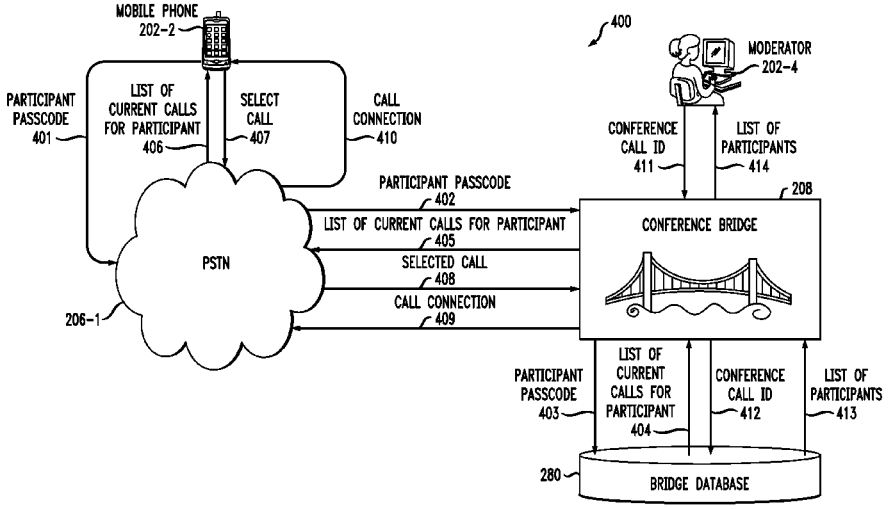
Primary Examiner — Sharad Rampuria

(74) *Attorney, Agent, or Firm* — Louis J. Percello; Ryan, Mason & Lewis, LLP

(57) **ABSTRACT**

A system comprises a plurality of user devices and a conference call bridge connected to the plurality of end user devices via one or more networks. The conference call bridge is configured to connect to a given one of the plurality of user devices, receive a passcode from the given user device, and authenticate the given user device using the passcode. The passcode is personal to the given user.

14 Claims, 8 Drawing Sheets



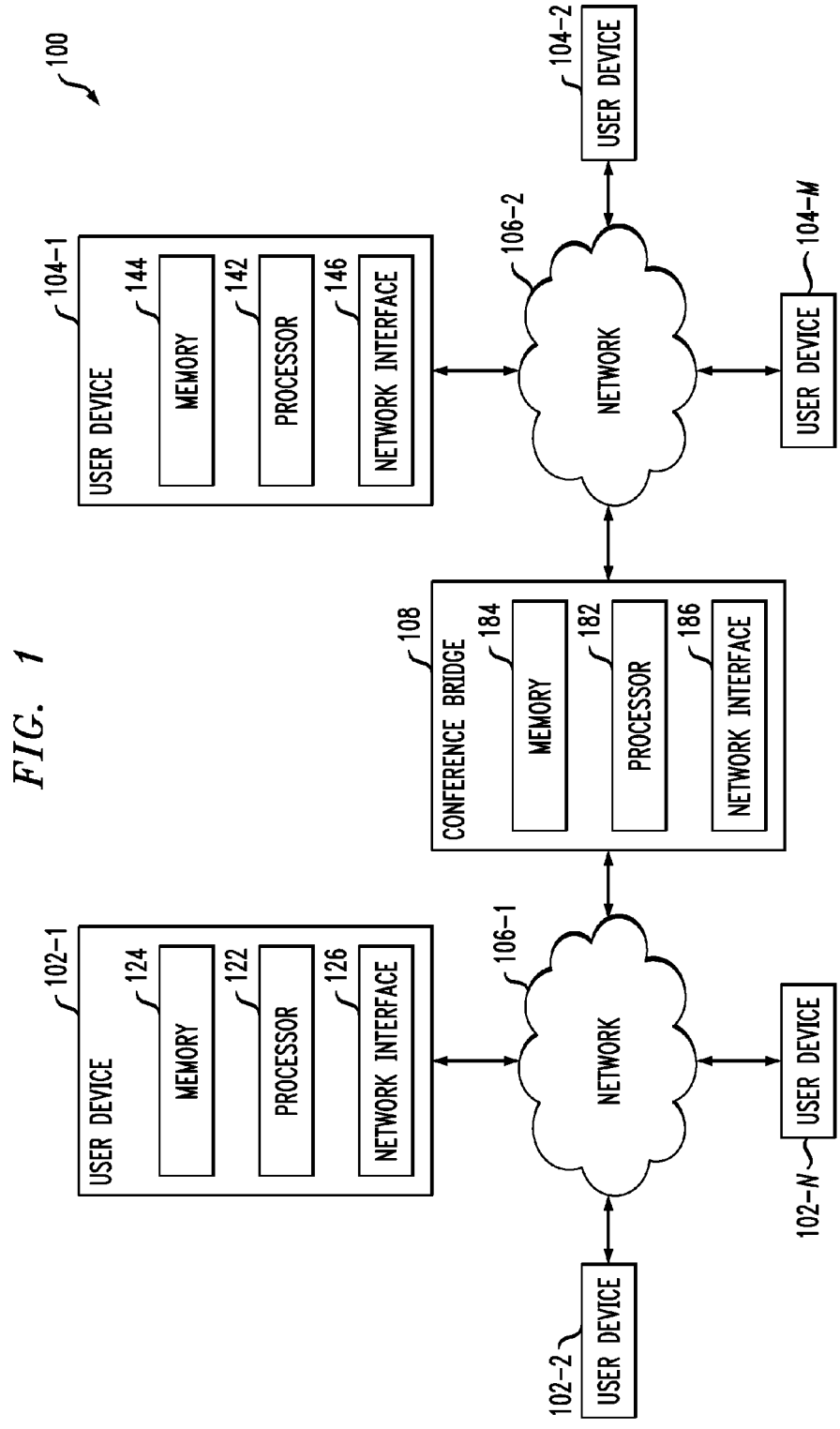
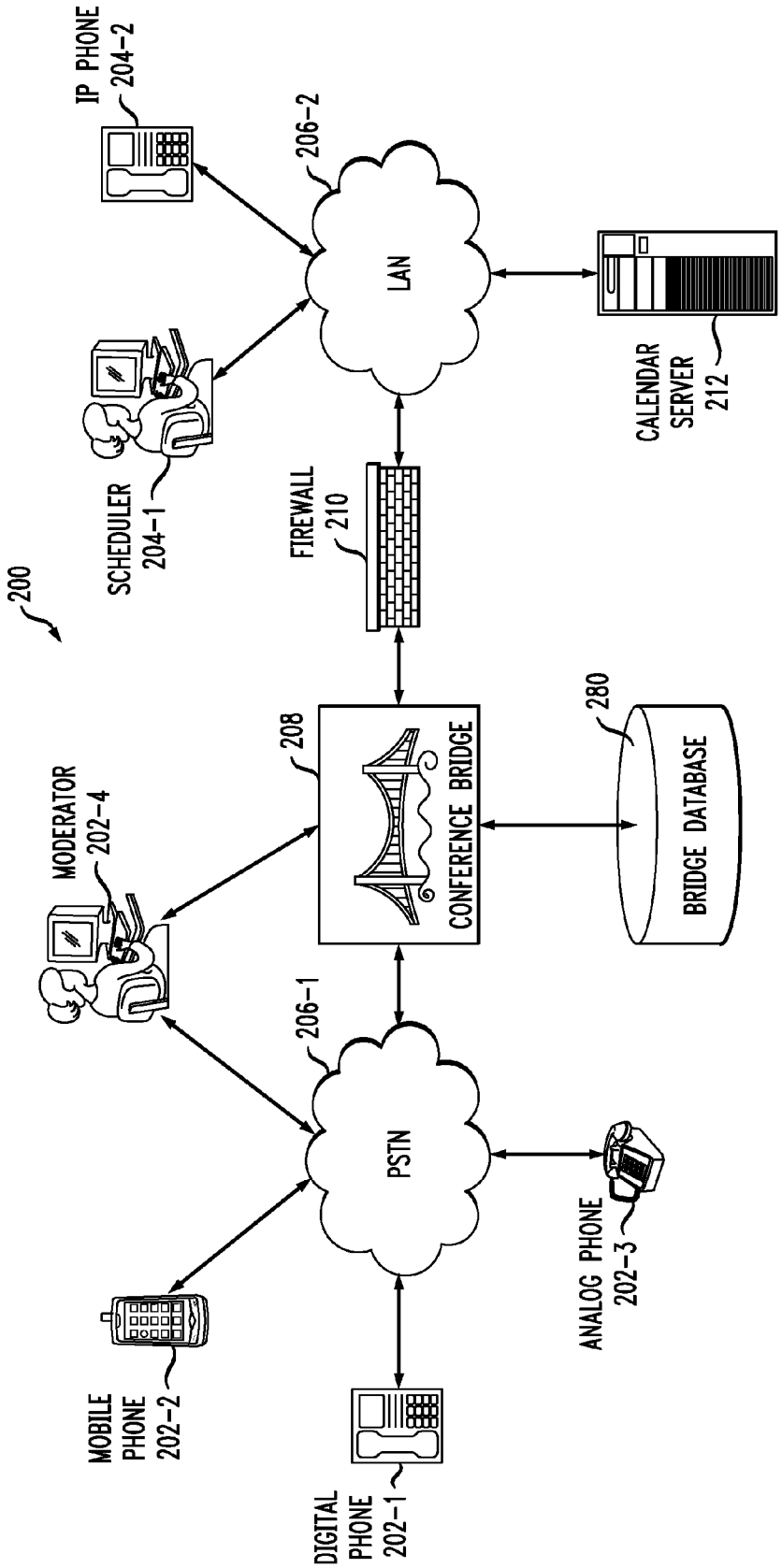

100
104-1
USER DEVICE
144
MEMORY
142
PROCESSOR
146
NETWORK INTERFACE
104-2
USER DEVICE
106-2
NETWORK
104-M
USER DEVICE
108
CONFERENCE BRIDGE
184
MEMORY
182
PROCESSOR
186
NETWORK INTERFACE
102-1
USER DEVICE
124
MEMORY
122
PROCESSOR
126
NETWORK INTERFACE
106-1
NETWORK
102-N
USER DEVICE
102-2
USER DEVICE

FIG. 1

FIG. 2


200
IP PHONE 204-2
206-2
LAN
SCHEDULER 204-1
FIREWALL 210
CALENDAR SERVER 212
208
CONFERENCE BRIDGE
280
BRIDGE DATABASE
MODERATOR 202-4
206-1
PSTN
MOBILE PHONE 202-2
ANALOG PHONE 202-3
DIGITAL PHONE 202-1

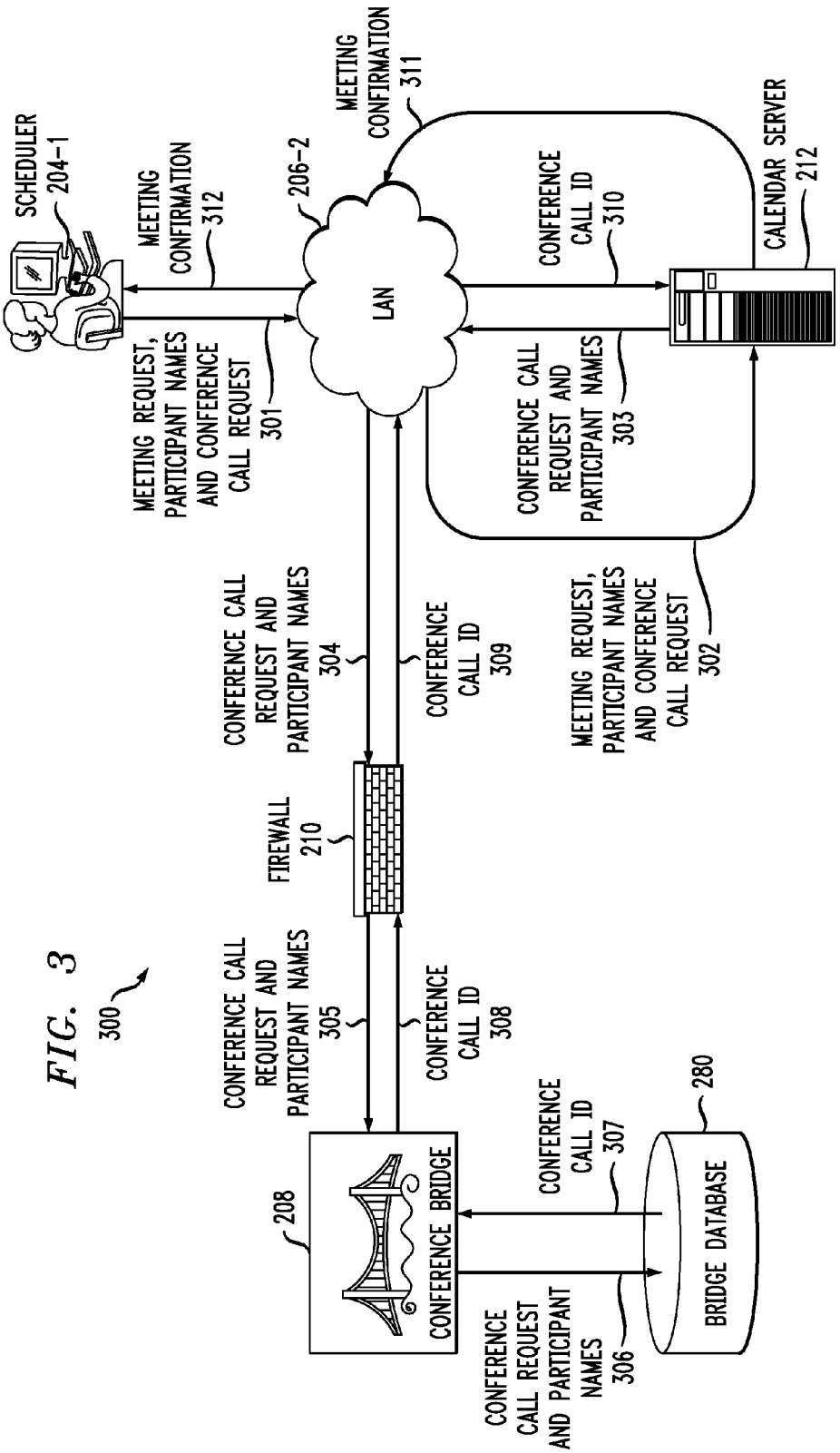

SCHEDULER
204-1
MEETING
CONFIRMATION
312
MEETING REQUEST,
PARTICIPANT NAMES
AND CONFERENCE
CALL REQUEST
301
206-2
LAN
MEETING
CONFIRMATION
311
CONFERENCE
CALL ID
310
CONFERENCE CALL
REQUEST AND
PARTICIPANT NAMES
303
CALENDAR SERVER
212
MEETING REQUEST,
PARTICIPANT NAMES
AND CONFERENCE
CALL REQUEST
302
CONFERENCE CALL
REQUEST AND
PARTICIPANT NAMES
304
CONFERENCE
CALL ID
309
FIREWALL
210
CONFERENCE CALL
REQUEST AND
PARTICIPANT NAMES
305
CONFERENCE
CALL ID
308
208
CONFERENCE BRIDGE
CONFERENCE
CALL ID
307
280
BRIDGE DATABASE
CONFERENCE
CALL REQUEST
AND PARTICIPANT
NAMES
306

FIG. 3

300

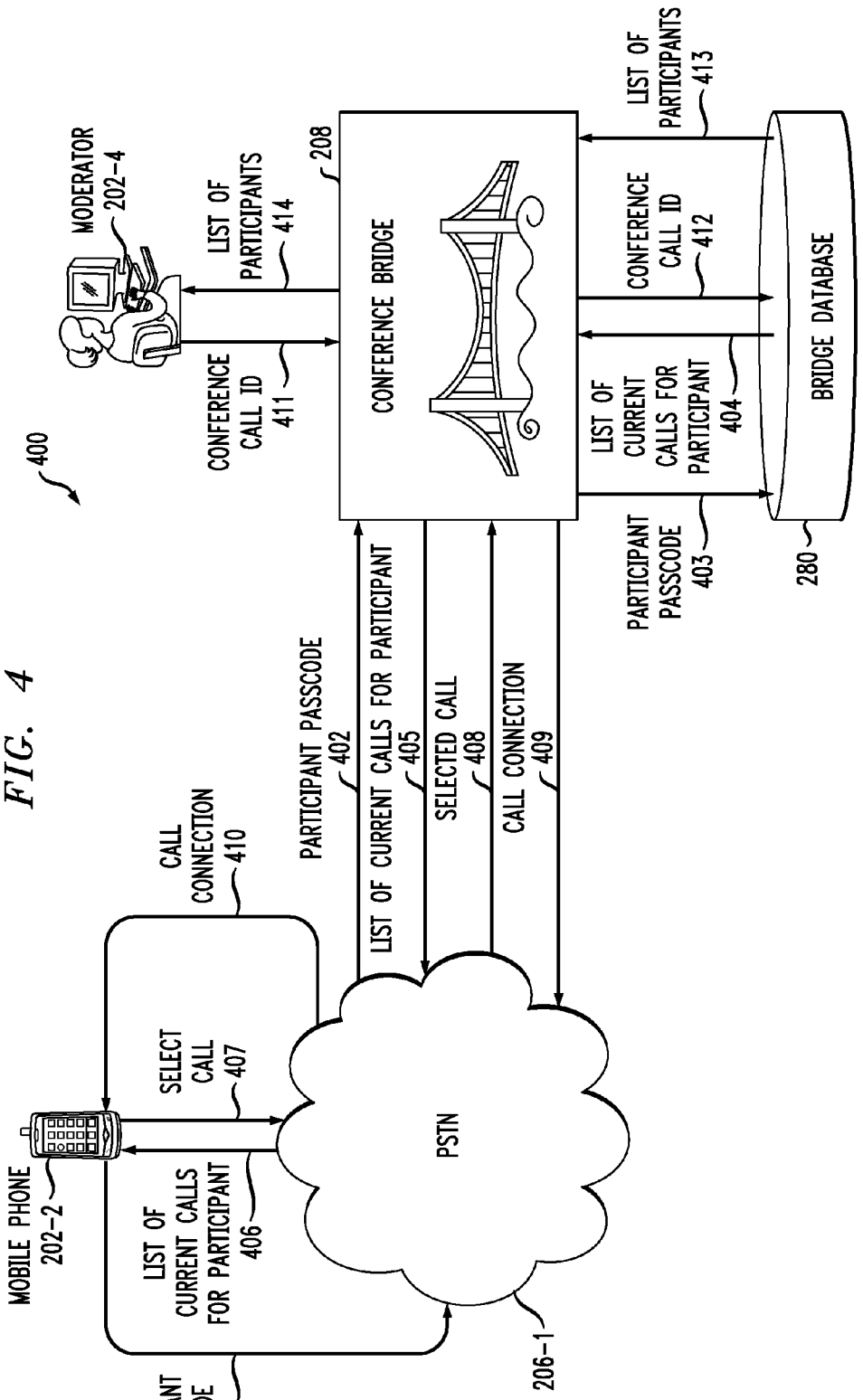

400
MODERATOR 202-4
MOBILE PHONE 202-2
CONFERENCE BRIDGE
208
BRIDGE DATABASE
280
PSTN
206-1
CONFERENCE CALL ID 411
LIST OF PARTICIPANTS 414
CONFERENCE CALL ID 412
LIST OF PARTICIPANTS 413
LIST OF CURRENT CALLS FOR PARTICIPANT 404
PARTICIPANT PASSCODE 403
PARTICIPANT PASSCODE 401
CALL CONNECTION 410
SELECT CALL 407
LIST OF CURRENT CALLS FOR PARTICIPANT 406
PARTICIPANT PASSCODE 402
LIST OF CURRENT CALLS FOR PARTICIPANT 405
SELECTED CALL 408
CALL CONNECTION 409

FIG. 4

FIG. 5

501

ID	NAME	MODERATOR ID	START TIME	END TIME
358883	PROJECT ALPHA DEVELOPMENT PLAN	42842341	2013.01.28:10:00:00	2013.01.28:10:30:00
374366	2013 DEPARTMENT STRATEGY	53243819	2013.01.28:10:00:00	2013.01.28:12:00:00

503

ID	LAST NAME	FIRST NAME
39137253	SMITH	ROBERT
33927668	JONES	ARNOLD
42842341	COLLIER	SAMANTHA
53243819	WILLIAMS	TONY
59345122	MILLER	SUSAN

505

RECORD	CONFERENCE ID	CALLER ID
39137253	358883	39137253
33927668	358883	33927668
37244231	358883	42842341
35227724	374366	33927668
34699563	374366	53243819
35888645	374366	59345122

FIG. 6

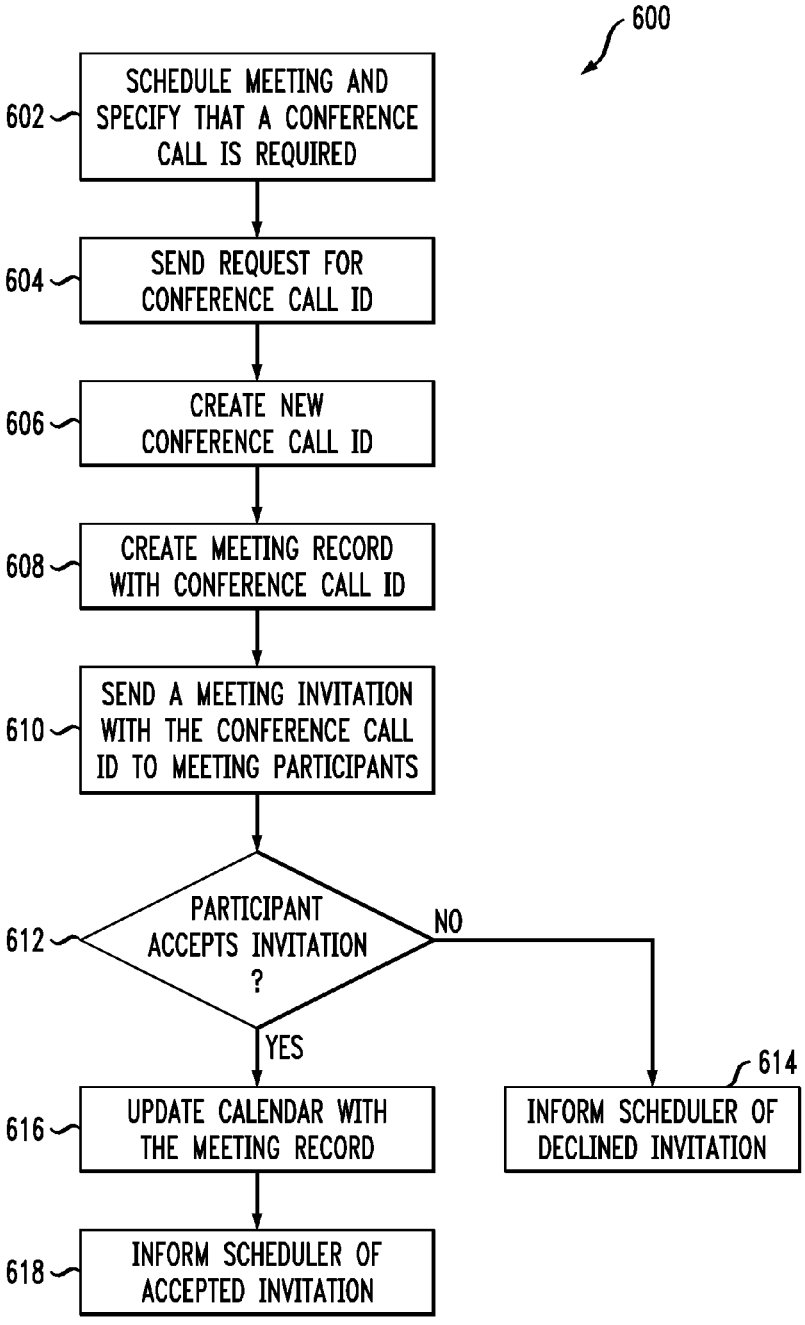

600
602
SCHEDULE MEETING AND SPECIFY THAT A CONFERENCE CALL IS REQUIRED
604
SEND REQUEST FOR CONFERENCE CALL ID
606
CREATE NEW CONFERENCE CALL ID
608
CREATE MEETING RECORD WITH CONFERENCE CALL ID
610
SEND A MEETING INVITATION WITH THE CONFERENCE CALL ID TO MEETING PARTICIPANTS
612
PARTICIPANT ACCEPTS INVITATION ?
NO
YES
614
INFORM SCHEDULER OF DECLINED INVITATION
616
UPDATE CALENDAR WITH THE MEETING RECORD
618
INFORM SCHEDULER OF ACCEPTED INVITATION

FIG. 7

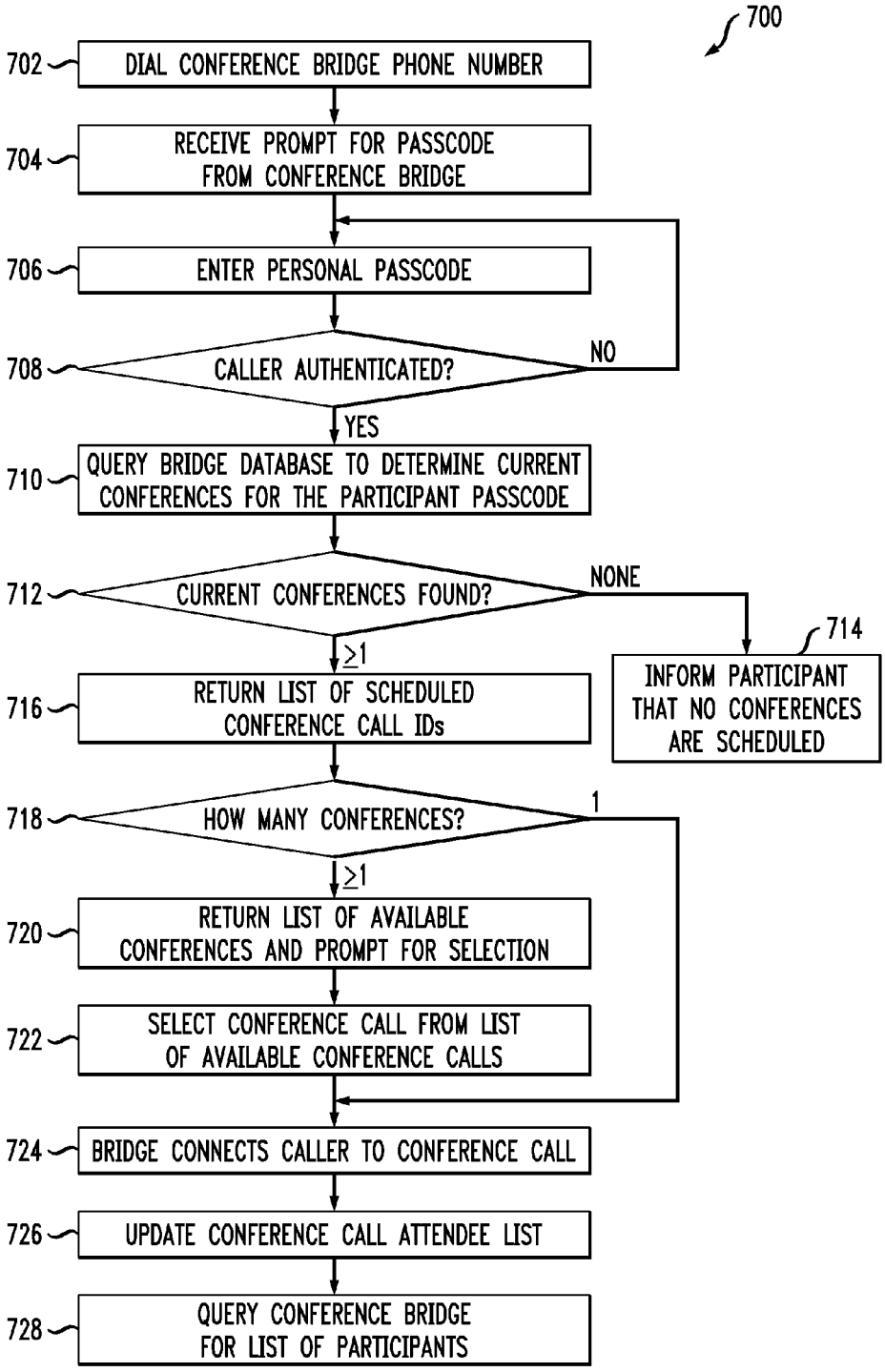
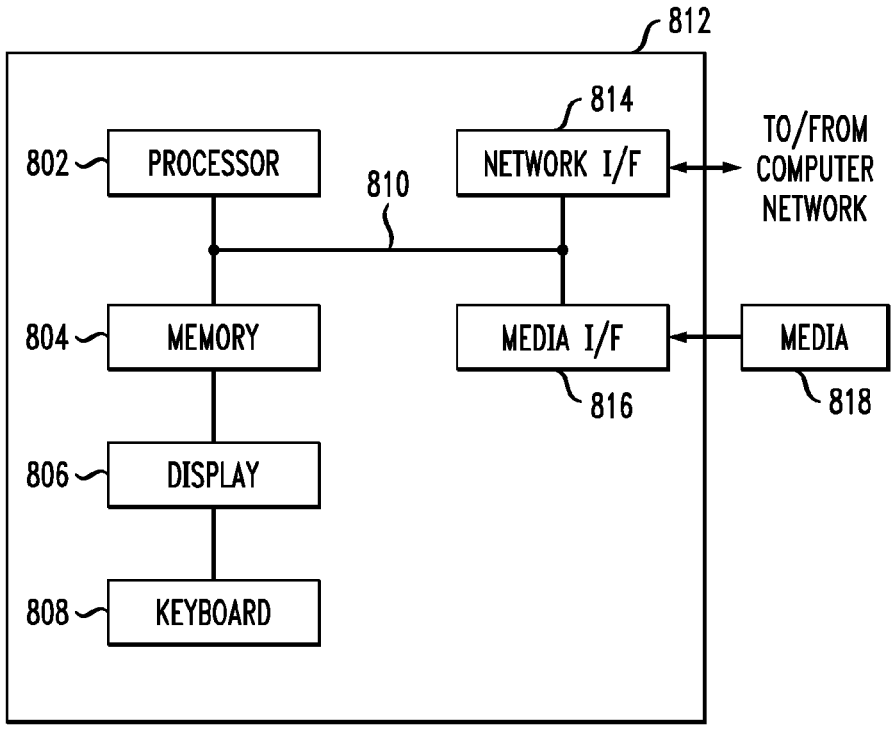

700
702
DIAL CONFERENCE BRIDGE PHONE NUMBER
704
RECEIVE PROMPT FOR PASSCODE FROM CONFERENCE BRIDGE
706
ENTER PERSONAL PASSCODE
708
CALLER AUTHENTICATED?
NO
YES
710
QUERY BRIDGE DATABASE TO DETERMINE CURRENT CONFERENCES FOR THE PARTICIPANT PASSCODE
712
CURRENT CONFERENCES FOUND?
NONE
≥1
714
INFORM PARTICIPANT THAT NO CONFERENCES ARE SCHEDULED
716
RETURN LIST OF SCHEDULED CONFERENCE CALL IDs
718
HOW MANY CONFERENCES?
1
≥1
720
RETURN LIST OF AVAILABLE CONFERENCES AND PROMPT FOR SELECTION
722
SELECT CONFERENCE CALL FROM LIST OF AVAILABLE CONFERENCE CALLS
724
BRIDGE CONNECTS CALLER TO CONFERENCE CALL
726
UPDATE CONFERENCE CALL ATTENDEE LIST
728
QUERY CONFERENCE BRIDGE FOR LIST OF PARTICIPANTS

FIG. 8


812
814
802
PROCESSOR
NETWORK I/F
TO/FROM
COMPUTER
NETWORK
810
804
MEMORY
MEDIA I/F
MEDIA
816
818
806
DISPLAY
808
KEYBOARD

CONFERENCE CALL AUTHENTICATION UTILIZING PASSCODES PERSONAL TO USERS

FIELD

The field relates to communications and, more particularly to techniques for managing communications.

BACKGROUND

Conference bridges are utilized to manage conference calls for various businesses, social groups and other entities. A conference bridge allows multiple participants to connect and establish a conference call with one another. Each conference call typically has a moderator and one or more participants. The moderator has access to one or more functions that are not available to other participants of the conference call. For a given conference call, participants must enter a passcode to join the conference call. The moderator may use a different passcode than other participants of a given conference call to access the moderator functions. To transfer from one conference call to another, a participant must disconnect from a first conference call, re-dial the conference bridge and enter a new passcode for a second conference call.

SUMMARY

According to one embodiment of the invention, a method comprises the steps of connecting to a conference call bridge, providing a passcode to the conference call bridge and authenticating to the conference call bridge using the passcode. The passcode is personal to a given user. The connecting, providing and authenticating steps are performed by at least one processing device.

According to another embodiment of the invention, a method comprises the steps of connecting to a given one of a plurality of user devices, receiving a passcode from the given user device and authenticating the given user device using the passcode. The passcode is personal to a given user. The connecting, receiving and authenticating steps are performed by at least one processing device.

According to another embodiment of the invention, a system comprises a plurality of user devices and a conference call bridge connected to the plurality of end user devices via one or more networks. The conference call bridge is configured to connect to a given one of the plurality of user devices, receive a passcode from the given user device, and authenticate the given user device using the passcode. The passcode is personal to the given user.

These and other embodiments of the invention will become apparent from the following detailed description of illustrative embodiments thereof, which is to be read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a conference call system, according to an embodiment of the invention.

FIG. **2** illustrates another conference call system, according to an embodiment of the invention.

FIG. **3** illustrates scheduling a conference call in the system of FIG. **2**, according to an embodiment of the invention.

FIG. **4** illustrates connecting to a conference call bridge in the system of FIG. **2**, according to an embodiment of the invention.

FIG. **5** illustrates information stored in a bridge database, according to an embodiment of the invention.

FIG. **6** illustrates a methodology for scheduling conference calls, according to an embodiment of the invention.

FIG. **7** illustrates a methodology for connecting to conference calls, according to an embodiment of the invention.

FIG. **8** illustrates a computing device in accordance with which one or more components/steps of techniques of the invention may be implemented, according to an embodiment of the invention.

DETAILED DESCRIPTION

Illustrative embodiments of the invention may be described herein in the context of illustrative methods, systems and devices for managing conference calls using a conference bridge. However, it is to be understood that embodiments of the invention are not limited to the illustrative methods, systems and devices described but instead are more broadly applicable to other suitable methods, systems and devices.

Conventional techniques for managing conference calls have a number of disadvantages and drawbacks. Participants in conference calls are required to look up or memorize unique passcodes for each conference call, which is inconvenient and time consuming for such participants. In some instances, participants must look up or memorize unique passcodes for each moderator rather than for each call. In addition, a user may be a participant for a number of conference calls, scheduled sequentially or for similar periods of time. To switch from one conference call to another, the user must disconnect from a first conference call and then dial a number and enter a new passcode for a second conference call.

It is also difficult to determine which participants are connected to a given conference call at a particular point in time. Many conventional techniques prompt participants to announce their entrance into a call. Thus, each time a participant joins a call, the flow of conversation may be interrupted to announce the entry of a new participant and for existing participants to announce themselves to the joining participant.

Embodiments of the invention overcome one or more of the above-noted drawbacks by utilizing conference call management techniques and conference call bridge systems wherein passcodes for accessing the system and calls are personal to particular users, rather than unique passcodes for each conference call. In some embodiments, conference call bridge systems integrate calendar systems for retrieval and management of call schedules for participants. Conference call bridge systems in embodiments of the invention connect participants to conference calls and provide techniques for informing moderators of active participants through associations between the personal passcodes and participant identities. Conference call bridge systems in embodiments of the invention also allow for management of concurrent conference calls, including permitting participants to switch between two or more conference calls without disconnecting from the conference call bridge or re-authenticating to the conference call bridge.

FIG. **1** illustrates a conference call system **100**. The system **100** includes a number of user devices **102-1**, **102-2**, . . . **102-N** connected to a network **106-1** and a number of user device **104-1**, **104-2**, . . . **104-M** connected to a network **106-2**. A conference bridge **108** is coupled between the networks **106-1** and **106-2**.

User device **102-1** comprises a processor **122**, a memory **124** and a network interface **126**. Similarly, user device **104-1** comprises processor **142**, memory **144** and network interface **146**. The conference bridge **108** also comprises a processor **182**, a memory **184** and a network interface **186**. The processors **122**, **142**, **182** may comprise a microprocessor, a microcontroller, an application-specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other type of processing circuitry, as well as portions or combinations of such circuitry elements. The memories **124**, **144**, **184** may comprise electronic memory such as random access memory (RAM), read-only memory (ROM), optical and magnetic disks, or other types of memory, in any combination. The network interfaces **126**, **146**, **186** comprise circuitry and other elements used to interface the user device **102-1**, user device **104-1** and conference bridge **108** to networks **106-1**, **106-2** and other system components. Such circuitry may comprise conventional transceivers of a type well known in the art. While not explicitly shown, user devices **102-2** to **102**-N and user devices **104-2** to **104**-M may also comprise processors, memories, and network interfaces as well as other circuitry and elements.

The networks **106-1** and **106-2** may be various types of networks, including combinations of network types. Network types include, by way of example, a wide area network (WAN), a local area network (LAN), a satellite network, a public switched telephone network (PSTN) or other telephone network, a cellular network, the Internet, and various portions of combinations of these and other network types.

The number N of user devices **102** and the number M of user devices **104** may be any arbitrary number. In addition, while FIG. **1** illustrates a system **100** with two networks **106-1** and **106-2**, embodiments of the invention may include systems wherein groups of user devices connect to a conference bridge using a single network, or more than two different networks.

FIG. **2** illustrates a conference call system **200**. In the system **200**, a number of user devices connect to a PSTN **206-1**, and a number of user devices connect to a LAN **206-2**. A digital phone **202-1**, mobile phone **202-2**, analog phone **202-3** and a moderator **202-4** connect to the PSTN **206-1**. The moderator **202-4** may utilize a variety of devices to connect to the PSTN **206-1**. A scheduler **204-1** and an internet protocol (IP) phone **204-2** connect to LAN **206-2**. The scheduler **204-1** may connect to the LAN **206-2** using a variety of user devices. It is important to note that embodiments of the invention are not limited solely to the specific number and arrangement of user devices shown in FIG. **2**. For example, in some embodiments more than one mobile phone, digital phone, or analog phone may connect to PSTN **206-1**. Similarly, a number of IP phones may connect to LAN **206-2**. In addition, user devices may connect to a conference bridge through one or more other networks and network types.

While FIG. **2** shows a system **200** wherein the moderator **202-4** connects to the conference bridge **208** through the PSTN **206-1** and the scheduler **204-1** connects to the conference bridge **208** through LAN **206-2**, embodiments of the invention are not limited to this arrangement. For example, the moderator may connect to the conference bridge through a LAN, or the scheduler **204-1** may connect to the conference bridge **208** through a PTSN. The moderator and scheduler may also connect to the conference bridge **208** from a same network. As another example, in some embodiments the scheduler and moderator may be the same. In addition, a participant at a given user device such as the mobile phone **202-2** may be a moderator or scheduler of one or more conference calls.

FIG. **2** shows the moderator **202-4** connected to both the PSTN **206-1** and conference bridge **208** to reflect special permissions or features which may be available to a moderator compared to other participants in a conference call, as will be discussed in further detail below. The moderator **202-4** and conference bridge **208**, however, need not establish a connection over a separate network or network interface.

A calendar server **212** may also connect to the LAN **206-2**. The LAN **206-2** may connect to the conference bridge **208** through a firewall **210**. While FIG. **2** shows a system **200** wherein the calendar server **212** is private (i.e., behind firewall **210**), in other embodiments of the invention the calendar server **212** may be considered public (i.e., not behind a firewall). The calendar server **212** may be implemented within a conference bridge or bridge database in other embodiments of the invention.

The PSTN **206-1** and LAN **206-2** connect to a conference bridge **208**. The conference bridge **208** may connect to a bridge database **280**. While FIG. **2** shows an arrangement wherein the bridge database **280** is external to the conference bridge **208**, in other embodiments a bridge database may be internal to a conference bridge rather than external to a conference bridge. The conference bridge **208** may also connect to the bridge database **280** over one or more networks.

In addition, it is important to note that although system **100** in FIG. **1** and system **200** in FIG. **2** show arrangements with only a single conference bridge, embodiments of the invention are not limited to these arrangements. Instead, in some embodiments user devices may be configured to connect to a number of distinct conference bridges, or to connect to a pool of two or more conference bridges which share a bridge database.

FIG. **3** illustrates a process flow **300** of scheduling a conference call in the system of FIG. **2**. Some of the elements of system **200** in FIG. **2** are omitted in FIG. **3** for clarity of illustration. The flow **300** begins with step **301**, with the scheduler **204-1** requesting a meeting. The request for a meeting specifies whether a conference call is requested, and the participants for the meeting and the conference call. Next, the LAN **206-2** forwards **302** the meeting request, conference call request and participant names to the calendar server **212**. The calendar server **212** will schedule a meeting, and forward **303** the conference call request and participant names back to the LAN **206-2**. The calendar server **212** may check permissions associated with the scheduler **204-1** prior to scheduling the meeting. While not shown, the calendar server **212** and scheduler **204-1** may communicate information regarding availability of participants and resources and other scheduling information prior to scheduling the meeting.

The LAN **206-2** forwards **304** the conference call request and participant names to the firewall **210**, which in turn forwards **305** the conference call request and participant names to the conference bridge **208**. The conference bridge **208** communicates with the bridge database **280** to send **306** the conference call request and participant names and receive **207** a conference call identification or conference call ID. As discussed above, in some embodiments the bridge database **280** may be incorporated within the conference bridge **208** rather than being external to the conference bridge **208**.

The bridge database **280** contains information relating to one or more conference calls and participants. For example, the bridge database **280** may include tables or mappings of participant names to participant passcodes. The bridge database **280** may include tables or mappings of conference call identifications, attendance status, participant permissions such as whether a particular participant is a moderator for a

given conference call, etc. Examples of such tables and information will be described in further detail below with respect to FIG. **5**.

The conference bridge **208** forwards **308** the conference call ID to the firewall **210**, which forwards **309** the conference call ID to the LAN **206-2**, which in turn forwards **310** the conference call ID to the calendar server **212**. The calendar server **212** stores the conference call identification with the meeting record, and sends **311** a meeting confirmation to the LAN **206-2** for forwarding **312** to the scheduler **204-1**.

While not explicitly shown in FIG. **3**, in some embodiments the calendar server **212** may also send a meeting confirmation to each of the participants specified in the meeting request. This confirmation may be sent immediately to each participant currently connected to the calendar server **208**, or may alternatively be queued such that when a participant next connects to the calendar server **212** the participant receives the meeting confirmation. The calendar server **212** may alternately send a meeting confirmation via an e-mail, text message, robocall, etc.

FIG. **4** illustrates a process flow **400** for connecting to a conference call bridge in the system **200** of FIG. **2**. For clarity of illustration, some of the elements of system **200** are omitted in FIG. **3**. A user device such as mobile phone **202-2** sends **401** a participant passcode to the conference bridge **208** via the PSTN **206-1**, which forwards **402** the participant passcode to the conference bridge **208**. The conference bridge **208** receives the participant passcode, and queries the bridge database **280** by sending **403** the participant passcode to the bridge database **280**. The bridge database **280** returns **404** a list of currently scheduled conference calls for the participant associated with the participant passcode.

The conference bridge **208** then sends **405** the list of currently scheduled conference calls to the mobile phone **204-2** through the PSTN **206-1**, which forwards **406** the list of currently scheduled conference calls to the mobile phone **204-2**. The mobile phone **204-2** sends **407** a selection of one of the currently scheduled conference calls to the conference bridge **208** through the PSTN **206-1**, which forwards **408** the conference call selection to the conference bridge **208**. The conference bridge **208** establishes **409** a connection for the selected conference call with the PSTN **206-1** and the PSTN **206-1** establishes **410** the call connection with the mobile phone **204-2**.

A moderator **204-2** may query **411** the conference bridge **208** with a particular conference call ID. The conference bridge **208** can forward **412** the query to the bridge database **280**. The bridge database **280** returns **413** to the conference bridge **208** a list of participants for the conference call ID specified in the query. The conference bridge **208** can return **414** this list of participants to the moderator **202-4**. While FIG. **4** shows a flow **400** wherein the moderator **202-4** queries a particular conference call ID to obtain a list of participants for a given conference call, embodiments of the invention are not limited solely to this arrangement. For example, a moderator **202-4** may specify a number of conference call identifications in a single query. A moderator **202-4** may also send a query seeking information on current or active participants in two or more conference calls. A moderator **202-4** may further query the conference bridge **208** with a particular participant name or identification to determine whether the given participant is connected to the conference bridge **208** or to a particular conference call.

In some embodiments, participants other than the moderator **202-4** may also query the conference bridge **208** for status information of a given conference call. For example, the mobile phone **202-2**, before or after establishing the call connection, may send a query to the conference bridge **208** to determine a list of active participants for the selected conference call. The conference bridge **208** and/or the bridge database **280** may check permissions associated with a particular participant before responding to queries. For example, when a meeting and conference call are scheduled, such as for example, in steps **301-302** of flow **300**, the scheduler **204-1** may specify that particular ones of the participants have access to particular information relating to a given conference call. In some embodiments, participants may be assigned a user class. When a meeting or conference call is scheduled, the scheduler **204-1** may specify particular user classes which have access to particular information rather than particular ones of the participants. A participant's personal code may be associated with his or her user class.

FIG. **5** illustrates examples of information which may be stored in a memory of a conference bridge or in a bridge database such as bridge database **280** in FIG. **2**. Table **501** includes a list of scheduled conference calls. Each conference call has an identification or ID number, a name, a moderator identification or ID number, a start time and an end time. The table **501** in FIG. **5** lists particular entries for two conference calls. A conference bridge or bridge database may have all conference calls in a single table listing, or may have separate tables for conference calls associated with particular entities or with particular service levels.

A conference bridge or bridge database may also include a table **503** which associates participant identifications or IDs with participant names. The participant IDs may be the passcodes for the participants. While the participant IDs in table **503** are shown as a series of numbers, embodiments of the invention are not limited solely to passcodes comprising strings of numbers. Instead, embodiments of the invention may utilize text strings or symbols in place of or in addition to numbers. A participant can enter the passcode using a dial or other input of a user device. A participant passcode may alternatively be an auditory passcode or voice identification process. For example, a participant may speak his or her name, a phrase, or code into a microphone or other input of a user device. The conference bridge may have dedicated hardware or software modules implemented via processors and other hardware for voice recognition to authenticate a participant or convert a spoken name, phrase or code into an alphanumeric sequence. The passcode may be any number of other types, including authentication tokens, biometric authentication using fingerprints or retina scans, etc. In some embodiments, participant passcodes may comprise a combination of two or more of the above-described passcode types. In addition, some embodiments may use a multi-factor authentication with two or more passcodes.

The conference bridge or bridge database may also include a table **505** which lists conference IDs and participant IDs. When a participant connects to a conference bridge and inputs his or her personal passcode, the conference bridge may perform a table lookup using table **505** to determine which conference calls are currently scheduled for the participant. It is important to note that while FIG. **5** shows three separate tables **501**, **503** and **505**, in some embodiments a conference bridge or bridge database may combine information from two or more of these tables into a single table, or store the information in a given one of these tables in two or more separate tables. It is also important to note that the information stored in the bridge database or conference bridge need not be stored in the form of tables as shown in FIG. **5**.

As shown in tables **501**, **503** and **505**, two conference calls are scheduled. Call 358883, the "Project Alpha Development

Plan" call, is moderated by Samantha Collier and includes Arnold Jones and Robert Smith as participants. Call 374366, the "2013 Department Strategy" call, is moderated by Tony Williams and includes Arnold Jones and Susan Miller as participants. Since Arnold Jones is a participant in both calls, and since calls 358883 and 374366 have the same starting time, when Arnold dials into the conference bridge, the bridge will inform Arnold that the two calls are currently scheduled and prompt Arnold to select a given one of the calls. After Arnold joins a particular call, he would have the option of switching to the other call without disconnecting from the bridge. The conference bridge may be programmed with a set of automated messages for participants. A sample greeting message when a participant connects to the conference bridge is as follows:

> Thank you for calling the conference bridge. Please choose between the following currently scheduled conference calls. One: 'Project Alpha Development Plan'. Two: '2013 Department Strategy." Please press zero for more options.

Participants may use dial pads or other input devices and methods such as voice recognition to navigate menus and options of the conference bridge.

FIG. **6** illustrates a methodology **600** for creating conference calls. The methodology **600** begins with step **602**, where a scheduler schedules a meeting and specifies that a conference call is required. The designation of scheduler as used herein refers to a user or participant who sets up a meeting and conference call. In some instances, the scheduler may also be a participant or moderator of the conference call. In other instances, the scheduler may set up the meeting and conference call but is not a participant or moderator of the conference call. Steps **301** and **302** in flow **300** of FIG. **3** are an example of step **602** in methodology **600**.

In step **604**, a request is sent for a new conference call ID. Next, a new conference ID is created **606**. The methodology **600** continues with step **608** of creating a meeting record with the conference call ID. It is important to note that while methodology **600** describes creating a new meeting record and conference call, a scheduler, moderator or other participant may also modify an existing meeting record and conference call. Thus, instead of sending a request for a conference call ID in step **604**, a scheduler may send a particular conference call ID which is to be modified or deleted. Steps **303-310** in flow **300** of FIG. **3** are an example of steps **604-608** in methodology **600**.

Next, a meeting invitation with the conference call ID is sent **610** to the meeting participants. As described above, a meeting invitation may be sent using a variety of different communication techniques, including e-mails, text messages, robocalls, etc. In step **612**, a determination is made as to whether particular participants have accepted the meeting invitation. If the participant declines the invitation, the methodology **600** informs **614** the scheduler of the declined invitation. If the participant accepts the invitation, the methodology **600** updates **616** a calendar with the meeting record and informs **618** the scheduler of the accepted invitation. Steps **311-312** in flow **300** of FIG. **3** are an example of steps **612-618** in methodology **600**.

FIG. **7** illustrates a methodology **700** for connecting to conference calls. The methodology **700** begins with a participant dialing **702** a conference bridge phone number. In some embodiments of the invention, a conference bridge may also be associated with an Internet hyperlink such that a user may select or enter a hyperlink to connect to the conference bridge. Participants may also connect to the conference bridge using a voice over IP (VoIP) connection. A single conference bridge may be configured to connect to users over a variety of network types as described above.

In step **704**, the conference bridge prompts the participant for a personal passcode. The participant enters **706** his or her personal passcode in response to the prompt. The conference bridge then makes a determination **708** as to whether a caller is authenticated. The conference bridge may determine whether the supplied personal passcode is a valid or active passcode and authenticate the user. For added security, in some embodiments the passcode which is personal to a user may be further tied to one or more devices. For example, a given participant may specify a set of devices for which the passcode is valid. If a user attempts to enter the personal passcode from a user device not in the specified set of devices, the conference bridge may deny authentication and request the participant to enter a new passcode. Alternatively, upon determining that a passcode is valid or active but that the user device is not in the specified set of devices, the conference bridge may request further information to authenticate the user or register and associate the user device with the personal passcode. Steps **401** and **402** in flow **400** of FIG. **4** are an example of steps **706-708** in methodology **700**.

Once a participant is authenticated, the conference bridge queries **710** a bridge database to determine current conferences for the participant passcode. Step **403** in flow **400** of FIG. **4** is an example of step **710** in methodology **700**. In step **712**, a determination is made as to whether any currently scheduled conference calls are found corresponding to the participant passcode. If there are no currently scheduled conference calls, the conference bridge informs **714** the participant that there are no scheduled conference calls. If more than one currently scheduled conference call is found, the bridge database returns **716** a list of conference IDs for currently scheduled conference calls to the conference bridge. Step **404** in flow **400** of FIG. **4** is an example of step **716** in methodology **700**.

In step **718**, a determination is made as to how many conference calls are currently scheduled. If more than one conference call is scheduled, the conference bridge returns **720** a list of available conference call and prompts the participant for selection of one of the currently scheduled conference calls. This list may be presented to the participant via text messages, emails, audio messages, etc. Next the participant selects **722** a conference call from the list of available conference. calls. Steps **405-408** in flow **400** in FIG. **4** are an example of steps **720** and **722** in methodology **700**.

Once the participant selects a conference call in step **722** or if only a single conference call is determined to be scheduled in step **718**, the conference bridge connects **724** the caller to the selected conference call. Steps **409** and **410** in flow **400** in FIG. **4** are an example of step **724** in methodology **700**. In some embodiments, the participant may not connect to a conference call even if there is at least one currently scheduled conference call for the participant. Instead, as will be detailed below, a participant may choose to leave a message for the moderator, one or more participants or for the conference call itself.

After the caller is connected to the selected conference call in step **724**, the conference bridge updates **726** the conference call attendee list. In step **728**, a moderator or other participant can query the conference bridge for a list of participants in the conference call. Steps **411-414** in flow **400** of FIG. **4** are examples of steps **726** and **728** in methodology **700**.

As described above, embodiments of the invention overcome a number of drawbacks of conventional approaches by utilizing passcodes which are personal to a participant. Thus, a participant need remember only a single passcode to con-

nect to a number of conference calls, to schedule conference calls, and otherwise manage conference calls with a conference bridge and calendar server. The use of a passcode personal to the user allows for simple identification of which participants are currently on a particular call. In addition, when a participant joins a call, the conference bridge may automatically announce the identification of the participant through the association of participant passcodes to participant names. Moderators and other participants may also query the conference bridge to obtain lists of active participants of a conference call. Thus, if a participant joins a conference call after one or more other participants, he or she can determine other participants who are present without disrupting the flow of conversation in the conference call by asking who is currently on the call.

The conference bridge may provide a number of other features for conference calls. A conference bridge may permit participants to connect to a call before a moderator joins the call and permit participants to continue a call after a moderator exits. In addition, a conference bridge may permit conference calls without moderator participation at all. As described above, a participant may also switch between in-progress conference calls without disconnecting and re-dialing or otherwise reconnecting to the conference bridge.

In some embodiments, the conference bridge may also be configured for hybrid conference calls. A hybrid conference call may be one in which some users have personal passcodes while others users share an access code. A conference bridge which implements embodiments of the invention may also be configured for conventional conference calls where all participants share an access code.

In other embodiments, the conference bridge may be configured to allow users and participants to leave messages for a moderator of a conference call or for other participants of a conference call. For example, a participant scheduled to join a call can choose to leave a message for the moderator explaining why the participant will be late or unable to join a conference call. A participant may also leave a message for other specific participants or leave a message for the conference call as a whole. These messages may be sent to participants of the conference call through text messages, emails or audio messages.

As will be appreciated by one skilled in the art, aspects of the present invention may be embodied as a system, apparatus, method or computer program product. Accordingly, aspects of the present invention may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, micro-code, etc.) or an embodiment combining software and hardware aspects that may all generally be referred to herein as a "circuit," "module" or "system." Furthermore, aspects of the present invention may take the form of a computer program product embodied in one or more computer readable medium(s) having computer readable program code embodied thereon.

Any combination of one or more computer readable medium(s) may be utilized. The computer readable medium may be a computer readable signal medium or a computer readable storage medium. A computer readable storage medium may be but are not limited to, for example, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, or device, or any suitable combination of the foregoing. More specific examples (a non-exhaustive list) of the computer readable storage medium would include the following: an electrical connection having one or more wires, a portable computer diskette, a hard disk, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, a portable compact disc read-only memory (CD-ROM), an optical storage device, a magnetic storage device, or any suitable combination of the foregoing. In the context of this document, a computer readable storage medium may be any tangible medium that can contain or store a program for use by or in connection with an instruction execution system, apparatus, or device.

A computer readable signal medium may include a propagated data signal with computer readable program code embodied therein, for example, in baseband or as part of a carrier wave. Such a propagated signal may take any of a variety of forms, including, but not limited to, electro-magnetic, optical, or any suitable combination thereof. A computer readable signal medium may be any computer readable medium that is not a computer readable storage medium and that can communicate, propagate, or transport a program for use by or in connection with an instruction execution system, apparatus, or device.

Program code embodied on a computer readable medium may be transmitted using any appropriate medium, including but not limited to wireless, wireline, optical fiber cable, RF, etc., or any suitable combination of the foregoing.

Computer program code for carrying out operations for aspects of the present invention may be written in any combination of one or more programming languages, including an object oriented programming language such as Java, Smalltalk, C++ or the like and conventional procedural programming languages, such as the "C" programming language or similar programming languages. The program code may execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer or server. In the latter scenario, the remote computer may be connected to the user's computer through any type of network, including a local area network (LAN) or a wide area network (WAN), or the connection may be made to an external computer (for example, through the Internet using an Internet Service Provider).

Aspects of the present invention are described herein with reference to flowchart illustrations and/or block diagrams of methods, apparatus (systems) and computer program products according to embodiments of the invention. It will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer program instructions. These computer program instructions may be provided to a processor of a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

These computer program instructions may also be stored in a computer readable medium that can direct a computer, other programmable data processing apparatus, or other devices to function in a particular manner, such that the instructions stored in the computer readable medium produce an article of manufacture including instructions which implement the function/act specified in the flowchart and/or block diagram block or blocks.

The computer program instructions may also be loaded onto a computer, other programmable data processing apparatus, or other devices to cause a series of operational steps to be performed on the computer, other programmable appara-

tus or other devices to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide processes for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks.

Referring again to FIGS. **1-7**, the diagrams in the figures illustrate the architecture, functionality, and operation of possible implementations of systems, methods and computer program products according to various embodiments of the present invention. In this regard, each block in a flowchart or a block diagram may represent a module, segment, or portion of code, which comprises one or more executable instructions for implementing the specified logical function(s). It should also be noted that, in some alternative implementations, the functions noted in the block may occur out of the order noted in the figures. For example, two blocks shown in succession may, in fact, be executed substantially concurrently, or the blocks may sometimes be executed in the reverse order, depending upon the functionality involved. It will also be noted that each block of the block diagram and/or flowchart illustration, and combinations of blocks in the block diagram and/or flowchart illustration, can be implemented by special purpose hardware-based systems that perform the specified functions or acts, or combinations of special purpose hardware and computer instructions.

Accordingly, techniques of the invention, for example, as depicted in FIGS. **1-7**, can also include, as described herein, providing a system, wherein the system includes distinct modules (e.g., modules comprising software, hardware or software and hardware).

One or more embodiments can make use of software running on a general purpose computer or workstation. With reference to FIG. **8**, such an implementation may employ, for example, a processor **802**, a memory **804**, and an input/output interface formed, for example, by a display **806** and a keyboard **808**. The term "processor" as used herein is intended to include any processing device, such as, for example, one that includes a CPU (central processing unit) and/or other forms of processing circuitry. Further, the term "processor" may refer to more than one individual processor. The term "memory" is intended to include memory associated with a processor or CPU, such as, for example, RAM (random access memory), ROM (read only memory), a fixed memory device (for example, hard drive), a removable memory device (for example, diskette), a flash memory and the like. In addition, the phrase "input/output interface" as used herein, is intended to optionally include, for example, one or more mechanisms for inputting data to the processing unit (for example, keyboard or mouse), and one or more mechanisms for providing results associated with the processing unit (for example, display or printer).

The processor **802**, memory **804**, and input/output interface such as a display **806** and keyboard **808** can be interconnected, for example, via bus **810** as part of data processing unit **812**. Suitable interconnections, for example, via bus **810**, can also be provided to a network interface **814**, such as a network card, which can be provided to interface with a computer network, and to a media interface **816**, such as a diskette or CD-ROM drive, which can be provided to interface with media **818**.

A data processing system suitable for storing and/or executing program code can include at least one processor **802** coupled directly or indirectly to memory elements **804** through a system bus **810**. The memory elements can include local memory employed during actual execution of the program code, bulk storage, and cache memories which provide temporary storage of at least some program code in order to reduce the number of times code must be retrieved from bulk storage during execution.

Input/output or I/O devices (including but not limited to keyboard **808** for making data entries; display **806** for viewing data; a pointing device for selecting data; and the like) can be coupled to the system either directly (such as via bus **810**) or through intervening I/O controllers (omitted for clarity).

Network adapters such as a network interface **814** may also be coupled to the system to enable the data processing system to become coupled to other data processing systems or remote printers or storage devices through intervening private or public networks. Modems, cable modem and Ethernet cards are just a few of the currently available types of network adapters.

As used herein, a "server" includes a physical data processing system (for example, system **812** as shown in FIG. **8**) running a server program. It will be understood that such a physical server may or may not include a display and keyboard. Further, it is to be understood that components may be implemented on one server or on more than one server.

It will be appreciated and should be understood that the exemplary embodiments of the invention described above can be implemented in a number of different fashions. Given the teachings of the invention provided herein, one of ordinary skill in the related art will be able to contemplate other implementations of the invention. Indeed, although illustrative embodiments of the present invention have been described herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to those precise embodiments, and that various other changes and modifications may be made by one skilled in the art without departing from the scope or spirit of the invention.

What is claimed is:

1. A method comprising the steps of:

connecting to a conference call bridge;

providing a passcode to the conference call bridge, the passcode being personal to a given user;

authenticating to the conference call bridge using the passcode, wherein authenticating to the conference call bridge using the passcode permits the given user to connect to one or more conference calls by matching the passcode to an identifier of the given user and matching the identifier of the given user to the one or more conference calls;

responsive to a successful authentication to the conference call bridge, obtaining a list of conference calls for the given user;

selecting a first one of the conference calls;

joining the first conference call via the conference call bridge; and

subsequently joining a second one of the conference calls without disconnecting from the conference call bridge;

wherein the steps are performed by at least one processing device.

2. The method of claim **1**, further comprising the steps of:

responsive to the successful authentication to the conference call bridge, scheduling a new conference call;

specifying one or more participants for the new conference call; and

obtaining a conference call identification for the new conference call.

3. The method of claim **2**, further comprising the step of sending an invitation to the one or more participants for the new conference call, the invitation comprising the conference call identification.

4. The method of claim 2, wherein specifying one or more participants for the new conference call further comprises specifying a moderator for the new conference call.

5. The method of claim 2, further comprising the step of storing a conference call record for the new conference call in a scheduler.

6. The method of claim 2, wherein specifying one or more participants for the new conference call further comprises specifying a set of passcodes, each of the passcodes being personal to a given one of the one or more participants.

7. The method of claim 1, wherein a single passcode is utilizable for joining a plurality of conference calls.

8. The method of claim 1, wherein obtaining the list of conference calls comprises querying a scheduler to determine conference calls available at a current time.

9. The method of claim 1, wherein responsive to joining the first conference call, the conference call bridge sends a list of participants for the first conference call to a moderator of the first conference call.

10. The method of claim 1, wherein the conference call bridge is configured to establish a given conference call with a first participant via a first network and a second participant via a second network, the second network being different than the first network.

11. The method of claim 10, wherein the first network comprises a public switched telephone network and the second network comprises a local area network.

12. The method of claim 1, wherein connecting to the conference call bridge comprises dialing a number associated with the conference call bridge.

13. A method comprising the steps of:

connecting to a given one of a plurality of user devices;

receiving a passcode from the given user device, the passcode being personal to a given user;

authenticating the given user device using the passcode, wherein authenticating the given user device using the passcode permits the given user device to connect to one or more conference calls by matching the passcode to an identifier of the given user and matching the identifier of the given user to the one or more conference calls;

responsive to a successful authentication of the given user device, sending a list of conference calls for the given user device;

receiving a selection of a first one of the conference calls;

joining the given user device to the first conference call via a conference bridge; and

subsequently joining the given user device to a second one of the conference calls without disconnecting the given user device from the conference bridge;

wherein the steps are performed by at least one processing device.

14. The method of claim 13, further comprising the steps of:

responsive to the successful authentication of the given user device, receiving a request from the given user device to schedule a new conference call specifying one or more participants for the new conference call;

generating a conference call identification for the new conference call; and

sending the conference call identification to the given user device.

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